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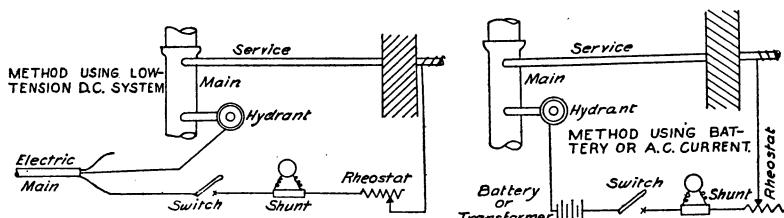
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THAWING FROZEN SERVICE CONNECTIONS BY MEANS OF ELECTRIC CURRENT¹

BY HENRY B. MACHEN

In the City of New York, due to the fact that many of the streets are paved with most expensive types of pavements on concrete base, making the cost of digging up a frozen service high, there should be a good demand for the apparatus necessary to thaw out the frozen service. However, the type of pavement as well as many other conditions, including the weather itself, reduces the number of cases where the supply is shut off from buildings to a comparatively small figure except in the very unusual winter which occurs from time to time.

However, due to the foresight on the part of the New York Edison Company, its distribution division is equipped to handle cases from $1\frac{1}{2}$ -inch lead service pipe, 30 feet long to a 6-inch submarine pipe 1700 feet long.



The system of putting the electric current to work is clearly shown on the diagram, both for cases where low tension direct current is available and for the cases where it is necessary to use a storage battery or only alternating current is available. In both cases it is necessary to complete the circuit through the house service pipe with the main by taking advantage of a nearby hydrant. Possibly

¹ Read before the Richmond Convention, May 10, 1917. The discussion of this paper was combined with that of the paper by W. I. McMane on "Thawing Frozen Water Mains and Service Pipes by Electricity," on page 544.

some of the failures recorded are due to attempting to complete the circuit through a hydrant connected to another main (due to poor record maps) in streets where there is more than one main in the ground.

During the winter of 1916-1917, which might be considered a fairly severe one, 42 orders were received. Of these three were cancelled as in two cases the water was found running and in the other because of a broken pipe. Thirty-eight were successful and one failure was registered, due possibly to some other obstruction than ice in the pipe.

THE NEW YORK EDISON COMPANY,
55 DUANE STREET,

OFFICE MEMORANDUM.

Case No.

MR. HENRY STEPHENSON,
Superintendent of Distribution:

Please call at.....
to thaw water main.

Owner.....

Address..... Telephone.....
Plumber.....

Address..... Telephone.....

Prices:

For pipe up to and including 1 inch.....	\$15.00
From 1 inch to 1 $\frac{1}{4}$ inches.....	20.00
From 1 $\frac{1}{4}$ inches to 1 $\frac{1}{2}$ inches.....	25.00
From 1 $\frac{1}{2}$ inches to 2 inches.....	30.00

These prices are for pipes up to 75 feet long.

Price for thawing risers, same as above. For First additional risers at same address \$10.00 extra. For each additional riser beyond this \$5.00 extra.

Payment to be made at time work is done.

.....
General Commercial Manager.

.....
Memorandum Receipt

Received of..... \$.....

for thawing main at.....

THE NEW YORK EDISON COMPANY,
per.....

The year 1911-1912 is the one of recent times, which, from the number of cases where orders were received, gives results which show the real value of this method of thawing out a frozen pipe.

Table 1 gives the results obtained, subdivided into several groups.

From the table it appears that equal success is obtainable whether the service pipe be lead or iron, whether it be $\frac{1}{2}$ -inch or 2-inch in diameter.

The procedure followed by the Edison Company in New York is to have a representative call on receipt of a request by mail or over the telephone from the owner or plumber, who, after investigation, fills out the form on page 539 giving the name of the owner or plumber. This form acts as an order to the working organization which attends to the work, giving a receipt for the money, using the lower portion of the form for the purpose.

TABLE 1
The New York Edison Company; report on thawing of frozen water service in winter 1911-1912

Successful cases

NUMBER OF CASES	KIND OF PIPE	AVERAGE LENGTH	AVERAGE MINUTES	AVERAGE AMPERES
		<i>feet</i>		
368	Lead	35.0	10.3	336.6
104	Iron	48.1	17.3	363.6
Totals.....	472	37.9	11.8	342.5

Unsuccessful cases

28	Lead	43.3	53.6	329.8
12	Iron	50.0	60.2	372.9
Totals.....	40	45.3	55.5	342.7
General averages.				
512		38.5	15.2	342.5

Details of successful cases

SIZE OF PIPE	KIND OF PIPE	NUMBER OF CASES	AVERAGE LENGTH	AVERAGE MINUTES	AVERAGE AMPERES
<i>inches</i>			<i>feet</i>		
$\frac{1}{2}$	Lead	8	33.7	19.6	250.0
$\frac{5}{8}$	Lead	180	36.1	8.1	323.6
$\frac{3}{4}$	Lead	55	18.2	8.3	350.6
1	Lead	75	40.4	14.5	340.6
$1\frac{1}{4}$	Lead	35	40.8	9.5	377.0
$1\frac{1}{2}$	Lead	12	42.9	20.8	360.4
2	Lead	3	52.3	13.0	416.6
Totals		368	35.0	10.3	336.4

TABLE 1—Continued

Unsuccessful cases

SIZE OF PIPE	KIND OF PIPE	NUMBER OF CASES	AVERAGE LENGTH	AVERAGE MINUTES	AVERAGE AMPERES
<i>inches</i>					
			<i>feet</i>		
$\frac{5}{8}$	Lead	6	42.5	32.3	315.0
$\frac{3}{4}$	Lead	2	37.5	73.0	300.0
1	Lead	5	41.0	63.6	323.0
$1\frac{1}{4}$	Lead	14	45.0	54.5	345.0
$1\frac{1}{2}$	Lead	1	50.0	80.0	300.0
Totals		28	43.3	53.6	329.8

Successful cases

$\frac{5}{8}$	Iron	2	32.5	7.0	287.5
$\frac{3}{4}$	Iron	53	42.0	9.4	341.9
1	Iron	20	57.5	29.7	369.7
$1\frac{1}{4}$	Iron	19	61.0	26.7	403.2
$1\frac{1}{2}$	Iron	8	39.3	13.7	393.7
2	Iron	2	45.0	40.0	450.0
Totals		104	48.1	17.3	363.6

Unsuccessful cases

$\frac{3}{4}$	Iron	1	30.0	33.0	325.0
1	Iron	1	40.0	120.0	325.0
$1\frac{1}{4}$	Iron	6	65.8	61.0	329.1
$1\frac{1}{2}$	Iron	3	35.0	60.3	366.6
2	Iron	1	30.0	22.5	750.0
Totals		12	50.0	60.2	372.9

Recapitulation

Total number of orders received.....	648
Total number of cases successfully thawed out.....	472
Total number of unsuccessful attempts*.....	40
Water running on our arrival.....	40
Services refused on our arrival.....	19
Cancelled—broken pipe.....	13
Cancelled—no plumber on job.....	14
Cancelled—found plumber digging on our arrival.....	3
Cancelled—obstruction in pipe.....	1

* After attempting to thaw no effort was made to learn cause of failure.

An examination of the prices charged shows the economy of this method when we appreciate that the Bureau of Highways in Manhattan requires a minimum deposit of \$56 for a street opening permit, the balance of which is held for six months after the pavement is restored.

In a number of smaller communities in the vicinity of New York the local electric companies have assembled a complete outfit on an auto truck, including rheostats, resistances, etc., and a storage battery for cases where the source of supply might be at too great a distance to warrant stringing a wire. This equipment is rented to a local plumber or water company, in a number of cases at a fixed sum of \$40 per day, the plumber or water company making direct arrangements with the property owner.

No story of the use of electricity in thawing out a frozen water main in New York would be complete without mention of the job of restoring the water supply to North Brothers Island in 1912.

North Brothers Island is located about 1700 feet from the Bronx main land and received its supply through a 6-inch main from the foot of 140th Street in the Bronx and from a 12-inch main feeding water from Rikers Island, both mains being of the usual submarine type. The main from 140th Street to North Brothers Island is 80 feet below the water surface at its maximum depth, and the Rikers Island main about 30 feet at the maximum. The island contains a number of hospital buildings for tuberculosis patients, some in the most advanced stages, the total population being about 500.

On February 12, 1912, notice was received in the Department of Water Supply that the supply to the island had stopped. Immediately the department force was dispatched to the Island, finding in a few minutes that both sources of supply were out of service. Continued effort to clear the ice by cutting out a section of pipe and forcing steam in produced no result, even though the steam hose had entered for a distance of 200 feet.

Temperatures taken on February 24 showed 40°F. in the open, the water at the surface 32° and at 50 feet depth but 29°. Again on March 5 a temperature of 29° was found in the river at 15 feet depth.

On March 6 the Edison Company was called upon to make an effort to thaw out the supply. All were skeptical of the result, it being realized that conditions were not at all similar to buried pipes, where the heat generated by current passing along the pipe might

be retained. Here, due to the flow of the tides, the cold water around the pipe was being constantly replaced.

A temporary frame shed was started at once on the shore of the East River and four 100-kilowatt transformers installed. These were to step-down the high tension current from 2000 volts to 200 volts. By 10 a.m. March 7, current was on, 800 amperes at 200 volts being used. By stages from day to day the amperage was raised so that in the morning of March 9 it was 1500 amperes at 400 volts, two additional 100-kilowatt transformers having been installed. The next day 1800 amperes at 368 volts were flowing from the main land through the pipe to the island.

On March 12, at 6.20 a.m., a little over 5 days after the current had been turned on and without the slightest warning, water started to flow. In a few minutes normal conditions were restored with a full and free flow. One thousand horse power had been used, which is 36 times the amount of heat necessary to melt the same quantity of ice on land. The author is indebted to Mr. Henry Stephenson for the details of the work placed at his disposal and liberally quoted from.